

ITCS 312: Automata

Quiz on Ch. 1b, Second semester 2007/2008, Form:

A

Name: _____

Student Number: _____

Section: _____

9
10

Section 1.

1. What is the grammar for the following language.

$$L = \{w \in \{a, b\}^* : w \text{ has at most three } b\text{'s}\}$$

$$S \rightarrow sa | \lambda | b | b | b | as$$

$$S \rightarrow AbA | AbAbA$$

sa

sa

sa

sa

$$S \rightarrow AbA | AbAbA | AbAbAbA | A$$

$$A \rightarrow AaA | \lambda$$

$$A \rightarrow aA | \lambda$$

2. What is the language generated by the following grammar?

$$S \rightarrow aaaSb | aa$$

$$L = \{ w \in \{a, b\}^* : a^n b^m, n \geq 0 \}$$



$$\begin{aligned} &+3 \begin{pmatrix} a \\ a^2 b \\ a^3 b^2 \\ a^4 b^3 \end{pmatrix} \\ &+2 \begin{pmatrix} a^2 b \\ a^3 b^2 \\ a^4 b^3 \end{pmatrix} \\ &+1 \begin{pmatrix} a^3 b^2 \\ a^4 b^3 \end{pmatrix} \\ &+0 \begin{pmatrix} a^4 b^3 \end{pmatrix} \end{aligned}$$

$$3S+2$$

$$2S+3$$

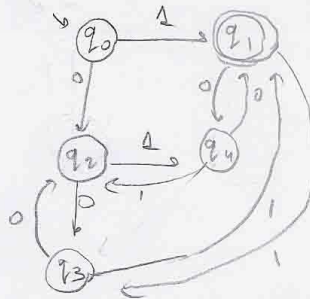
$$6+2=8$$

$$9+2=11$$



Second Quiz on Ch. 2b, Second semester 2007/2008,
Form: A

Section:

$$\frac{9}{10}$$
$$L = \{w \in \{0,1\}^* : w \text{ has an odd number of 1's and an even number of 0's}\}$$


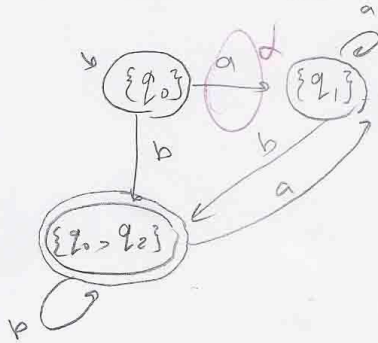
0000
10000
00 | 11 | 0
000 ←
arm

✓

gq

```

graph LR
    start(( )) --> q0((q0))
    q0 -- a --> q1((q1))
    q1 -- b --> q0
    q1 -- a --> q1
    q1 -- a --> q2(((q2)))
    q2 -- b --> q2
  
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ITCS 312: Automata

Quiz on Ch. 4, Second semester 2007/2008, Form:

A

Name: _____

Student Number: _____

Section: _____

Section 1.

1. Prove or disprove that the following language is regular.

$$L = \{w \in \{a, b\}^* : n_a(w) = 3n_b(w)\}$$

$$\text{let } w = a^{3m} b^m = xyz$$

$$\text{such that } |xy| \leq m \quad |y| \geq 1$$

$$y = a^k, \quad 1 \leq k \leq m$$

$$w_0 = a^{3m(0-1)k} b^m$$

$$= a^{3m-k} b^m \notin L \quad \text{since } 1 \leq k \leq m$$

$\therefore L$ is not regular

2. Prove or disprove that the following language is regular.

$$L = \{a^{3^n} : n \geq 0\}$$

$$\text{let } w = a^{3^m}$$

$$\text{since } |xy| \leq m \quad \text{and } |y| \geq 1$$

$$w = xyz$$

$$\text{let } y = a^k, \quad 1 \leq k \leq m$$

$$w_2 = a^{3^m + k}$$

$$\text{I have to prove that } 3^m < 3^m + k < 3^{m+1}$$

$$3^m + k > 3^m \quad \text{because } k \geq 1$$

$$3^m + k \leq 3^m + 3^m + 3^m = 3(3^m)$$

$$= 3^{m+1}$$

$$\therefore 3^m < 3^m + k < 3^{m+1}$$

$$\therefore w_2 \notin L$$

$\therefore L$ is not regular.

ITCS 312: Automata

Quiz on Ch. 6, Second semester 2007/2008, Form:

A

Name: _____

Student Number: _____

Section: _____

Section 1.

Remove unit, λ -, and useless productions from
1. Show that the following grammar is ambiguous.

$S \rightarrow aA|aBB$
 $A \rightarrow aaA|\lambda$
 $B \rightarrow bB|bbC$
 $C \rightarrow B$

7/6/5
10

$V_N = \{A\}$

remove λ

$S \rightarrow aA|aBB|aA$

$A \rightarrow aaA|aa$

$B \rightarrow bB|bbC$

$C \rightarrow B$

remove unit production

$S \rightarrow a|aBB|aA$

$A \rightarrow aaA|aa$

$B \rightarrow bB|bbB|bb$

remove useless production B useless

~~$S \rightarrow a|a$~~

1.5

~~$S \rightarrow a|abb|abbb|aA$~~

~~$A \rightarrow aaA|aa$~~

$S \rightarrow a|aBB|aA$

$A \rightarrow aaA|aa$

$B \rightarrow bB|bbB|b|bbb$

2

1

UOB BH
STUDENTS